DOCUMENT RESUME

ED 096 118 SE 018 018

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TITLE	Seeking a Regularity.
INSTITUTION	Delaware State Dept. of Public Instruction, Dover.; Del Mod System, Dover, Del.
SPONS AGENCY	National Science Foundation, Washington, D.C.
REPORT NO	NSF-GW-6703
PUB DATE	30 Jun 73
NOTE	3p.; Related documents are SE 018 020 and 023
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	*Autoinstructional Programs; Behavioral Objectives; *Chemistry; Instruction; *Instructional Materials; Science Education; *Secondary School Science; Teacher Developed Materials; Units of Study (Subject Fields)
IDENTIFIERS	*Del Mod System

ABSTRACT

This autoinstructional unit deals with the phenomena of regularity in chemical behavior. The prerequisites suggested are two other autoinstructional lessons (Experiments 1 and 2) identified in the Del Mod System as SE 018 020 and SE 018 023. The equipment needed is listed and 45 minutes is the suggested time allotment. The Student Guide includes the Objective which indicates that, given a set of data, the student should be able to state a regularity involving the data. Experiment 3, Behavior of Solids on Warming, is the learning experience presented in this packet. An introduction, the procedure to be followed and questions for discussion are presented. (EB)

SEEKING A REGULARITY

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June 30, 1973

Printed and disseminated through the office of the Del Mod Component Coordinator for the State Department of Public Instruction, John G. Townsend Building, Dover, Delaware 19901

Preparation of this monograph was supported by the National Science Foundation Grant No. G.W. 6703 to the Del Mod System, P. O. Box 192, Dover, Delaware 19901

TEACHER'S GUIDE

PACKET NUMBER	540.018 S1
SUBJECT	Chemistry
TITLE	Seeking A Regularity
LEVEL	High School
PREREQUISITES	AT 540.018 S and AT 540.018 Sg
BEHAVIORAL OBJECTIVES	Given sets of data, the student will state a regularity involving the data
EQUIPMENT	Small beaker or can Ringstand, ring, wire gauze Burner Candle Tool for cutting off piece of candle Tin can lid (*with 3 depressions) Metric ruler Small piece of: sulfur, lead, tin, copper, steel wool, silver chloride *Depressions may be placed in the can lid as follows: Position the lid on a piece of wood with the unlacquered side up. Place the ball of a ball hammer about 1 cm from the edge of the can. Hit the head with the mallet. Repeat to make the other indentations.
TIME	45 minutes
ASSESSMENTS	One copy of experiment
SPACE REQUIRED	Lab station

STUDENT GUIDE

AT 540.018 SEEKING A REGULARITY
S1

OBJECTIVE: Given sets of data, the student will state a regularity involving the data.

In Experiment 1 and Optional Experiment 1 you were concerned only with listing observations. In Experiment 2 you continued making observations but here you worked on ways to better organize the data. The next step is to attempt to seek a principle or a regularity out of mass of data. This is one of the most powerful tools available to the scientists. It will help you tremendously in your work in this course. Experiment 3 will get you started.

Go to Closet A and find the box labeled AT-3. In the box you will find the materials needed to perform Experiment 3. When you finish the experiment return all materials to where you found them.

EXPERIMENT 3

BEHAVIOR OF SOLIDS ON WARMING

INTRODUCTION:

Careful observation of a familiar object usually reveals characteristics not recognized before. You noted this as you studied the candle in Experiment 1. These details of observation raise questions. Let us give attention to one such question. "What is the colorless liquid in the bowl at the top of the burning candle?" This is a question with a ready answer. Perhaps the liquid is just melted wax. But how do you know this? What evidence can you offer? What kind of experiment would help you to decide if this ready answer is correct?

Let us proceed by comparing the behavior of several different substances when heated.

PROCEDURE:

Part 1

a. Place the tin can lid on an iron ring attached to a ring stand. (Be careful in handling the can lid.) The lid has three depressions to contain some of the substances to be tested. Adjust the height of the ring until the lid is about 8 cm above the candle.

EXPERIMENT 3

BEHAVIOR OF SOLIDS ON WARMING

b. Place on the lid, equally spaced near the edge, small, approximately equal amcunts of each of the following substances (a quantity about the size of a pea is appropriate): candle wax, tin, copper, steel wool, sulfur, silver chloride, lead. Place the candle wax, sulfur, and silver chloride each in a separate depression in the lid, and space the others equidistant from each other.

c. Light the candle, and adjust the ring height until the tip of the flame is about 4 cm directly below the center of the lid. Heat the lid for about 3 minutes. Record your observations as you make them, paying particular attention to the melting behavior. It is important to frequently touch the unmelted substances. Use the tip of a pair of tweezers or tongs. Remember also that melting involves a change from solid to liquid. A color change does not constitute melting.

d. Remove the candle and adjust the height of the iron ring so that the lid is in contact with the hottest part of the burner flame. Heat the lid with the burner flame

adjusted about 5 cm high for about 3 minutes. Increase the size of the flame and heat for several minutes more.

e. Compare the order of melting that you obtained with those of two other groups. (Those students doing the experiment alone can find data from other groups in Envelope 1 which is in the box labeled AT-3.

Part 2

Now let us heat some of the solidified liquid from the bowl of the candle and some of the candle wax to see how they compare.

a. When the lid has cooled, remove it from the ring stand and replace it with a wire gauze and a 250 milliliter (ml) beaker about one-third full of water. (The can lid and the materials on it can be discarded.)

b. Pour a few drops of the liquid from the bowl of a burning candle onto a piece of paper. Break off a small piece of the solid and place it on the water container in the beaker. Obtain a piece of candle wax by cutting a chip from the bottom of your candle. Place the second piece on the water in the beaker.

EXPERIMENT 3

BEHAVIOR OF SOLIDS ON WARMING

c. Heat the beaker and its contents with a burner flame and note when each substance <u>starts</u> to melt. Allow the melted material to solidify, then discard it in the waste basket. Do not pour the melted material in the sink.

QUESTIONS:

Part 1

1. What statement can you make concerning the material in the bowl of the burning candle and the candle wax based on your generalization from question 2? Are they the same material or are they two different substances?